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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/385,584	08/27/1999	MICHAEL B. BALL	3817US-97-1	9380

7590 06/14/2002

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EXAMINER

ABRAHAM, FETSUM

ART UNIT PAPER NUMBER

2826

DATE MAILED: 06/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/385,584

Applicant(s)

BALL ET AL.

Examiner

Fetsum Abraham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 33-37 and 41-56 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 33-37, 41-56 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

FETSUM ABRAHAM
PRIMARY EXAMINER

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Final rejection

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 33-37,41-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schwiebert et al (PN: 5,672,542)

The reference discloses a solder mask (544) of uniform thickness (see figure 5) with multiple apertures (330) located to correspondingly to contact pad locations on a substrate upon which the pre-formed mask is to be deposited on or adhered to the substrate. Although the prior art calls the contact regions as wettable regions on the substrate, it is clear that the different expression addresses the same structure, contact regions on the substrate. Further, the patent introduces different types of solder masks as possible replacement for the preferred metallic mask, out of which one is a non-metal polymer solder mask as in column 7, 17-45. This material is specifically addressed to be one of the preferred materials in page 5 of the specification and also the non-metallic nature of the mask according to the independent claims in the application. The material is also in claim 2 and directly implied in claim 1 to have been the mask that went through the process of claim 1. Furthermore, the patent teaches that the mask apertures are aligned with the wettable (bump) regions of a surface to receive bumps, clearly establishing the claimed invention. Although the prior art omits using similar phrases to define the same concept (such as

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“wettable” instead of contact area or region), it would have been obvious to one skilled in the art to safely conclude the similarity of the claimed invention and the prior art because all claimed elements are addressed by the patent.

As for claims 34,44, a non peripheral region of said contact pad is understood to be the active surface of the contact pad whereby contact material is deposited. In the patent, the contact area defines the contact region which also is the active contact area on the substrate.

The structure has alignment holes on the mask and the substrate to align the apertures in both elements, clearly indicating that the peripheral regions of the contact pad are not involved in the contact structure as can be seen in figures 3A. In figure 3D, the lower surface of the contact material (338) falls directly on the contact area over the substrate avoiding the peripheral areas of the contact area.

As for claims 35,45, the height of the apertures dictate terms as to the height of the conductive structures formed through the holes since the conductive materials can not exceed the height of the mask. Anything beyond that height is the active contact region of the contact material.

As for claims 37,47,55 the material characteristic claimed is inherently possessed by the structure since it is open to use similar polymer material as the mask.

As for claims 48,56 the abstract teaches that the mask remains attached to the substrate during reflow clearly suggesting adherence between the substrate and the mask at least until the process of reflow is complete.

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As for claims 51,53 most feedthrough contacts are made to be structures beyond the upper surface of the intermediate dielectric material in order to have a reasonable are of contact Although conductors are sometimes made to conform to the dielectric upper surface as shown by (PN: 5,880,017) to conserve material and processing time. In both cases, the choice is design oriented.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Refer PN: 5,880,017.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Examiner's response to applicant's argument

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Applicant's argument that *prima facie* case of obviousness was not established in the past actions has been acknowledged and provided herein. The difference in expressing the same concept as discussed above is the main reason for the obvious similarity between both structures.

Applicant argues that the prior art does not include any teaching that correlates the polymeric mask in the manner described in figure 5 the prior art. The argument, however is moot in view of the fact that the prior art includes polymeric masks as alternative to metallic masks while teaches in general how masks are applied based on the metallic mask as a model structure.

As for the aperture on a contact pad location, column 7, 40-45 of the patent clearly discloses the same claimed structure. In the paragraph, mask aperture is located on bump forming region for bump formation. Further, although the prior art teaches that mask apertures are generally larger than wettable regions, it also stresses that the dimension relationship is not required, suggesting that the apertures may also be the same in dimension as the wettable regions. In lines 50-55, column 7, the prior art teaches that aperture size is determined by the bump size required.

As for the argument that the prior art teaches that the solder becomes spherical, it stresses the final shape only if circular pad was used. Otherwise, it also teaches the BLM could also be octagonal (see column 7, 55-60).

As for the argument that the patent omits an opening to define a peripheral shape, any opening on a mask indeed defines a peripheral region of contact area for which it is designed. The

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peripheral areas of contact regions is by default the outer areas of the contacts themselves.

Therefore, the argument is moot in light of such an understanding.

As for the argument based on the absence of "pre formed" mask, the examiner strongly disagrees. The mask of the prior art is an independent entity separate from the substrate.

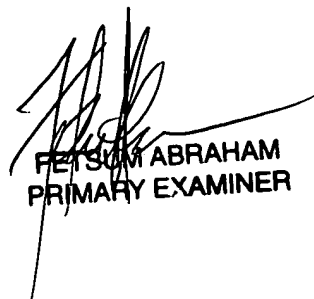
Therefore, it is pre-formed ahead of its contact with the substrate. All elements in claims 33-49 are addressed by the prior art.

Clearly, the prior art emphasizes on non-metallic mask, but also teaches other materials including polymeric for the same. As long as the method of using the mask is described based on the metallic mask and no other method is presented in relation to the polymeric mask, that method remains to be generic to the alternate materials too. This is the general understanding and the basis for the rejection.

Any inquiry concerning this communication should be directed to Fetsum Abraham at telephone number (703) 305,3793, or by E-mail at fetsum.abraham@uspto.gov.

Any inquiry of a general nature or relating to the status of this application should be directed to the *SPE of AU:2826* at (703)308-6601, or the *Group receptionist* at (703) 308-0956.

Fetsum Abraham/6/12/02



FETSUM ABRAHAM
PRIMARY EXAMINER